Overview of the Spokane Valley -- Rathdrum Prairie Aquifer

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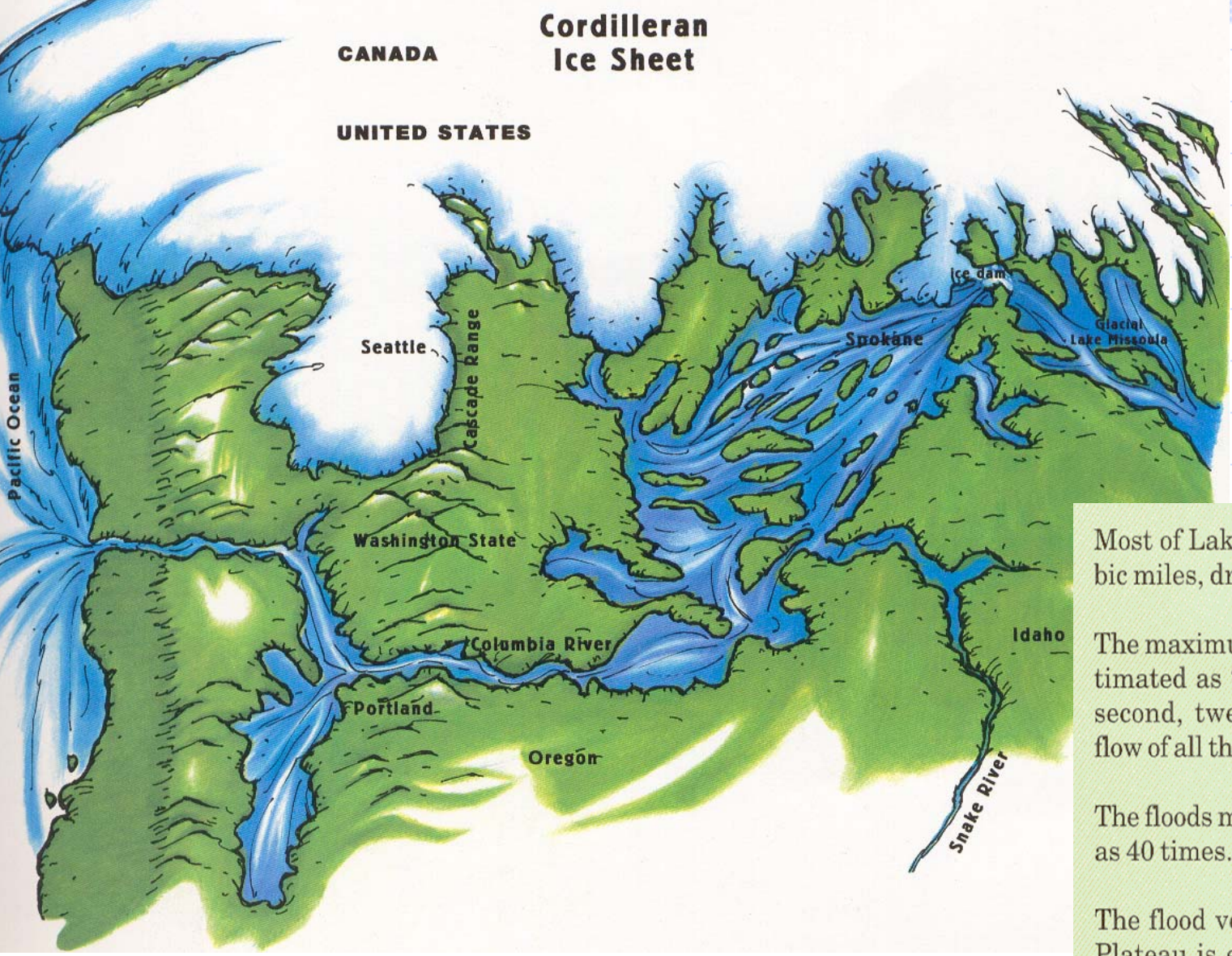
Outline of Presentation

- Description of the aquifer
- Recharge and discharge characteristics
- Long-term ground water fluctuations
- GW-SW interconnection
- Water quality issues
- Ground water management problems and opportunities



Pacific northwest during the last ice age -- 15,000 to 12,000 years ago

Most of Lake Missoula, about 500 cubic miles, drained in a few days.

The maximum flood discharge was estimated as 750 million cubic feet per second, twenty times the combined flow of all the rivers in the world today.

The floods may have occurred as many as 40 times.

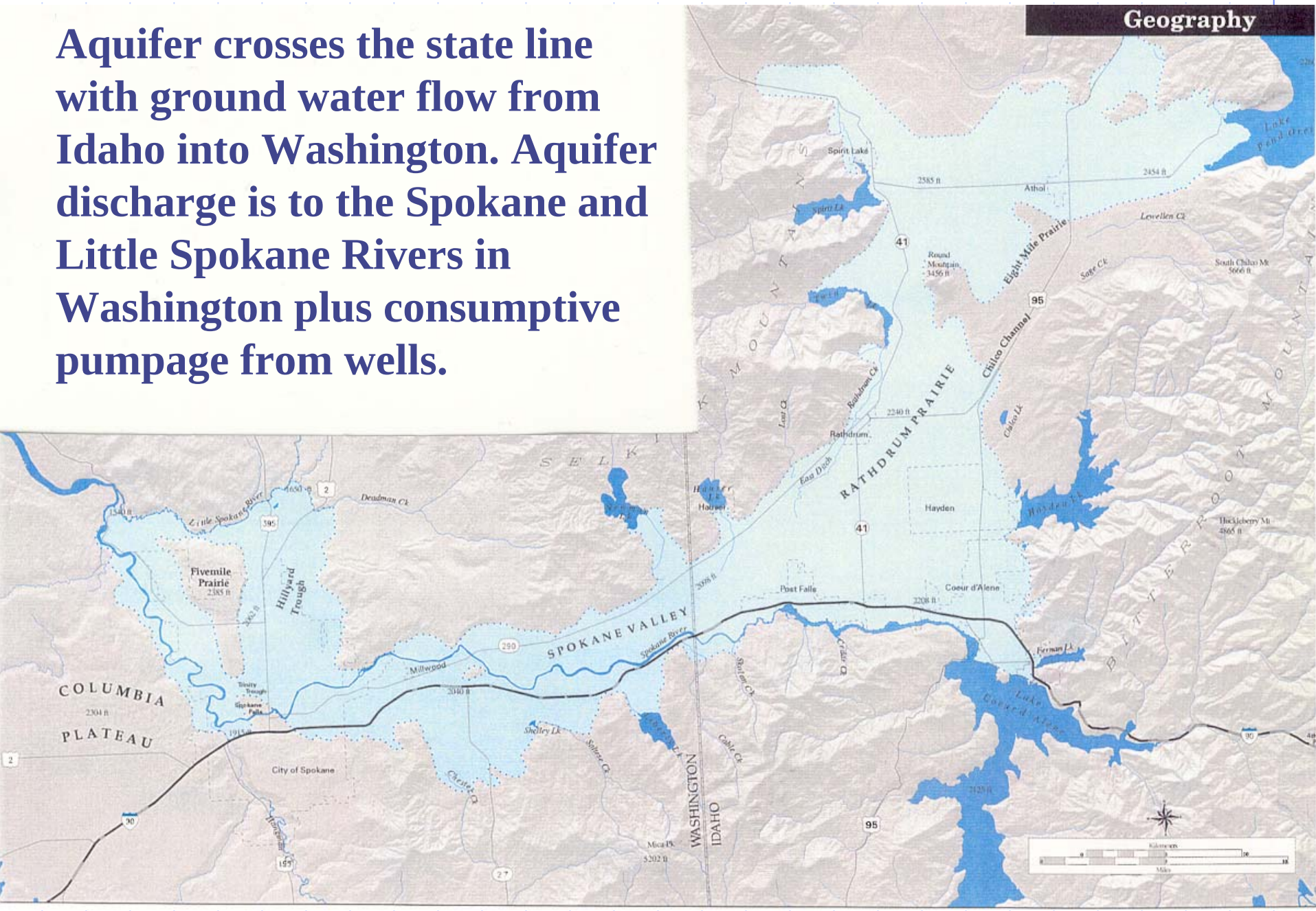
The flood velocity over the Columbia Plateau is estimated at 45 miles per hour.

The flood carried boulders as large as 8 to 10 feet across to the Spokane Valley – Rathdrum Prairie region.

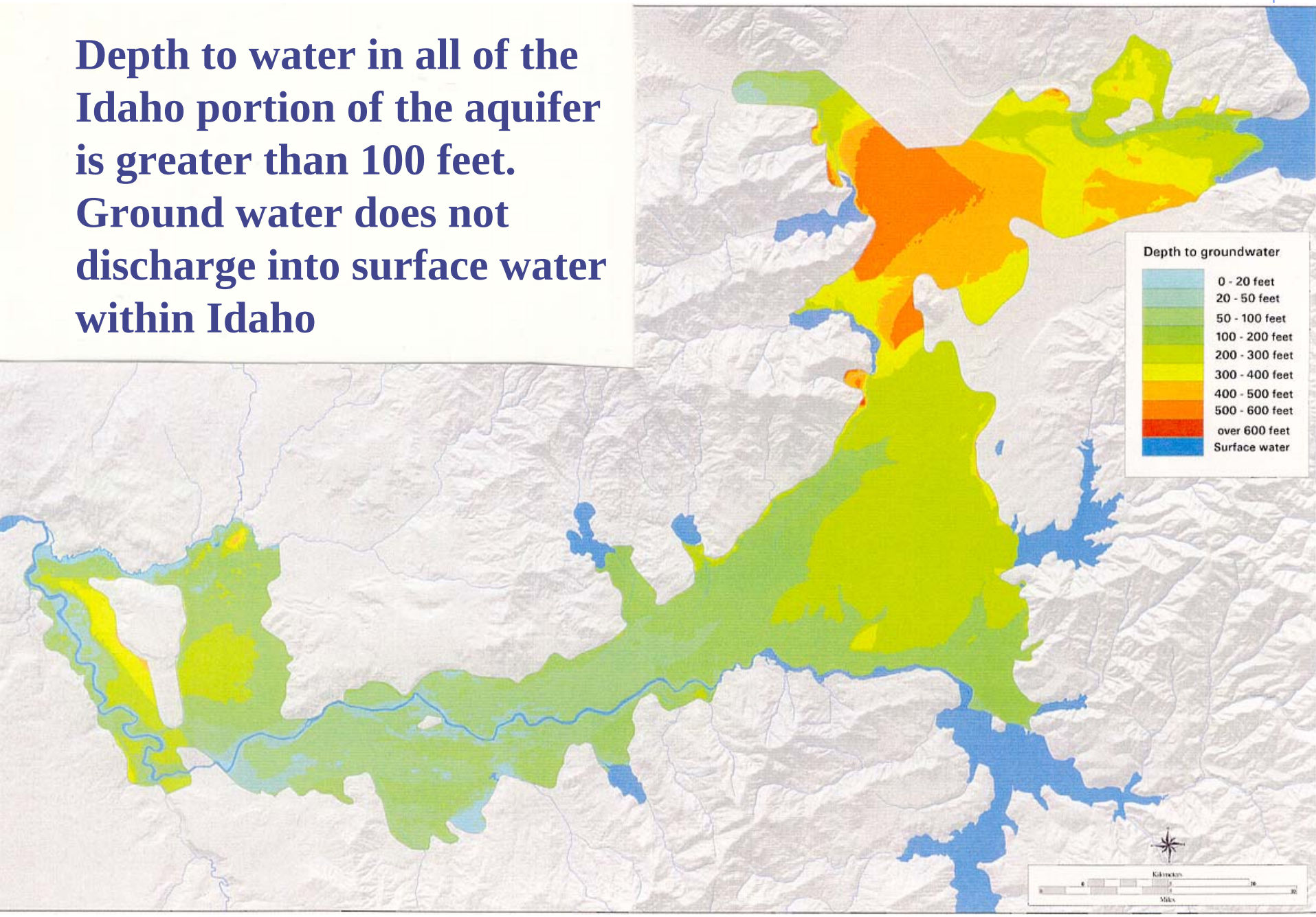
Glacial Flood Sediments Form the Aquifer

- Floods eroded away basalt and older fine-grained sediment
- Larger material (boulders, cobbles and coarse gravel) were deposited along the center of the valley with finer sediments deposited in side eddy valleys
- Most wells penetrate only a few tens of feet into the aquifer and have high yields with little drawdown

Aquifer crosses the state line with ground water flow from Idaho into Washington. Aquifer discharge is to the Spokane and Little Spokane Rivers in Washington plus consumptive pumpage from wells.

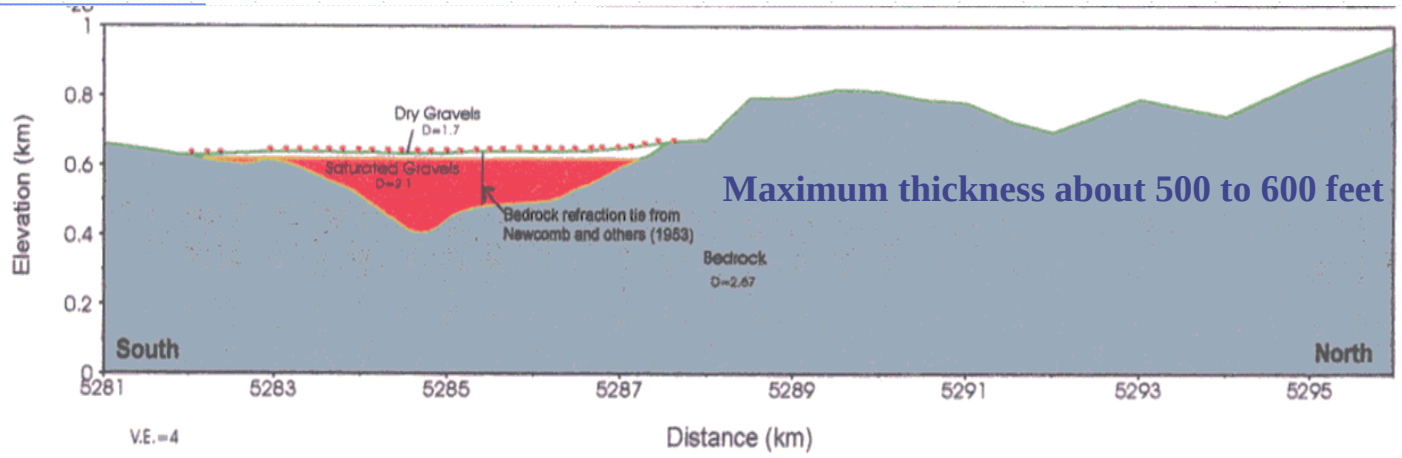


Depth to water in all of the Idaho portion of the aquifer is greater than 100 feet. Ground water does not discharge into surface water within Idaho

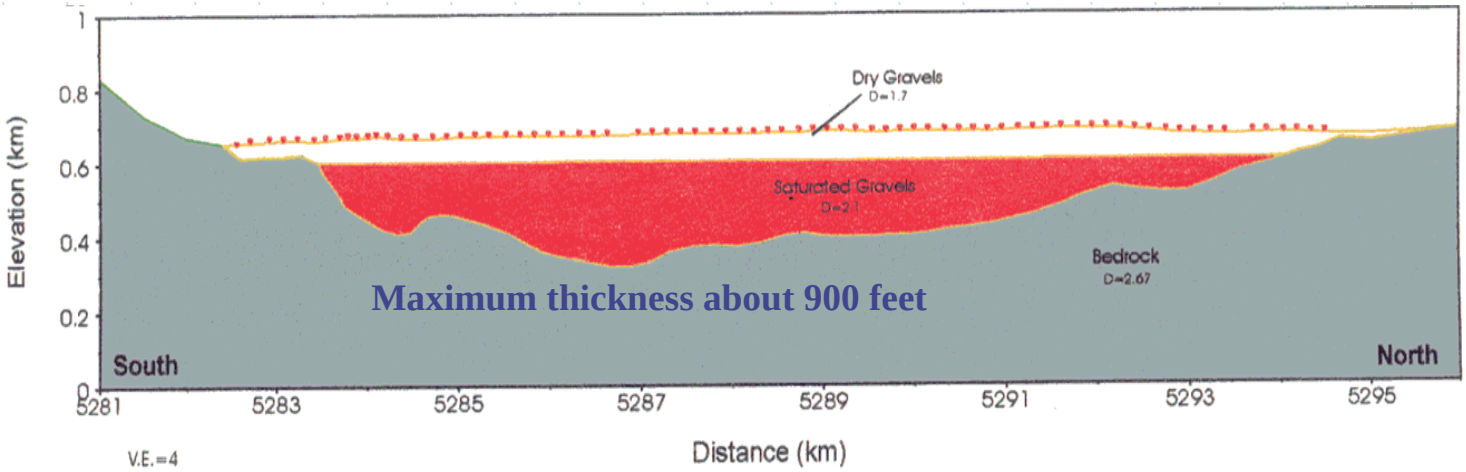


Geophysical Surveys Provide Our Primary Knowledge of the Thickness of the Aquifer

North-South Cross Section Near the State Line



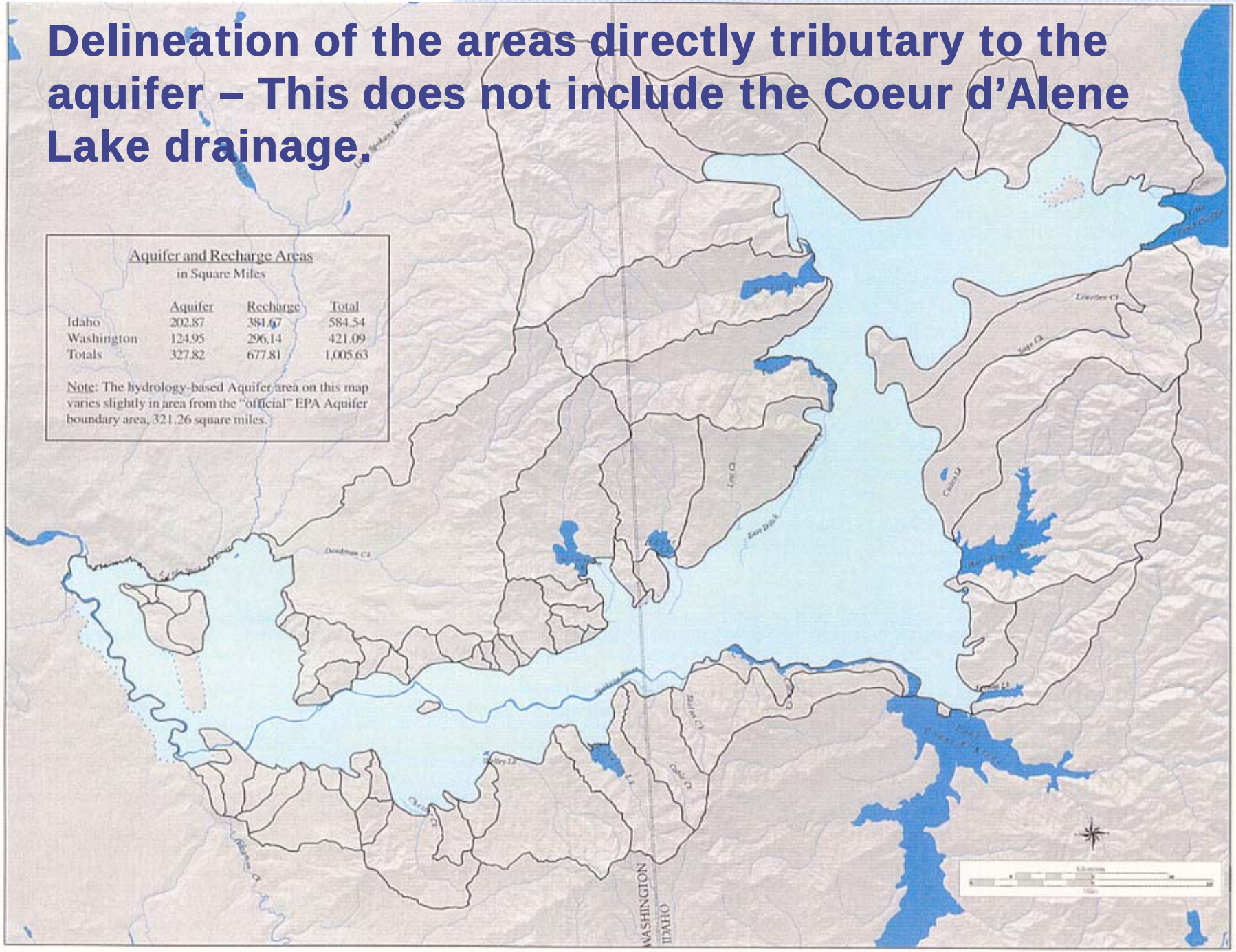
North-South Cross Section Along Highway 41to Rathdrum



Ground Water Recharge to the Spokane Valley – Rathdrum Prairie Aquifer

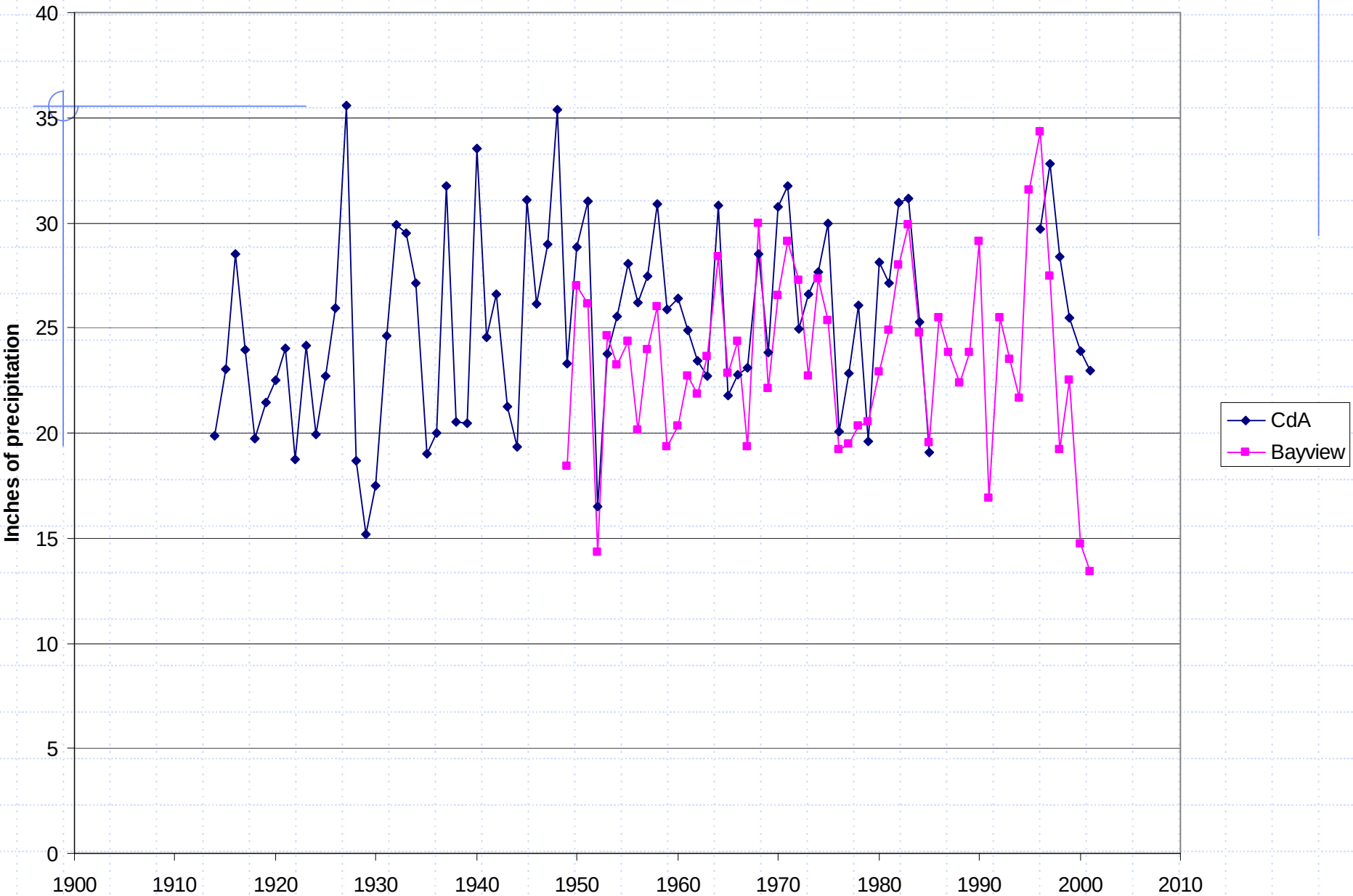
- Precipitation on the aquifer
- Inflow from tributary valleys
- Leakage from Coeur d'Alene Lake and Spokane River

Delineation of the areas directly tributary to the aquifer – This does not include the Coeur d'Alene Lake drainage.

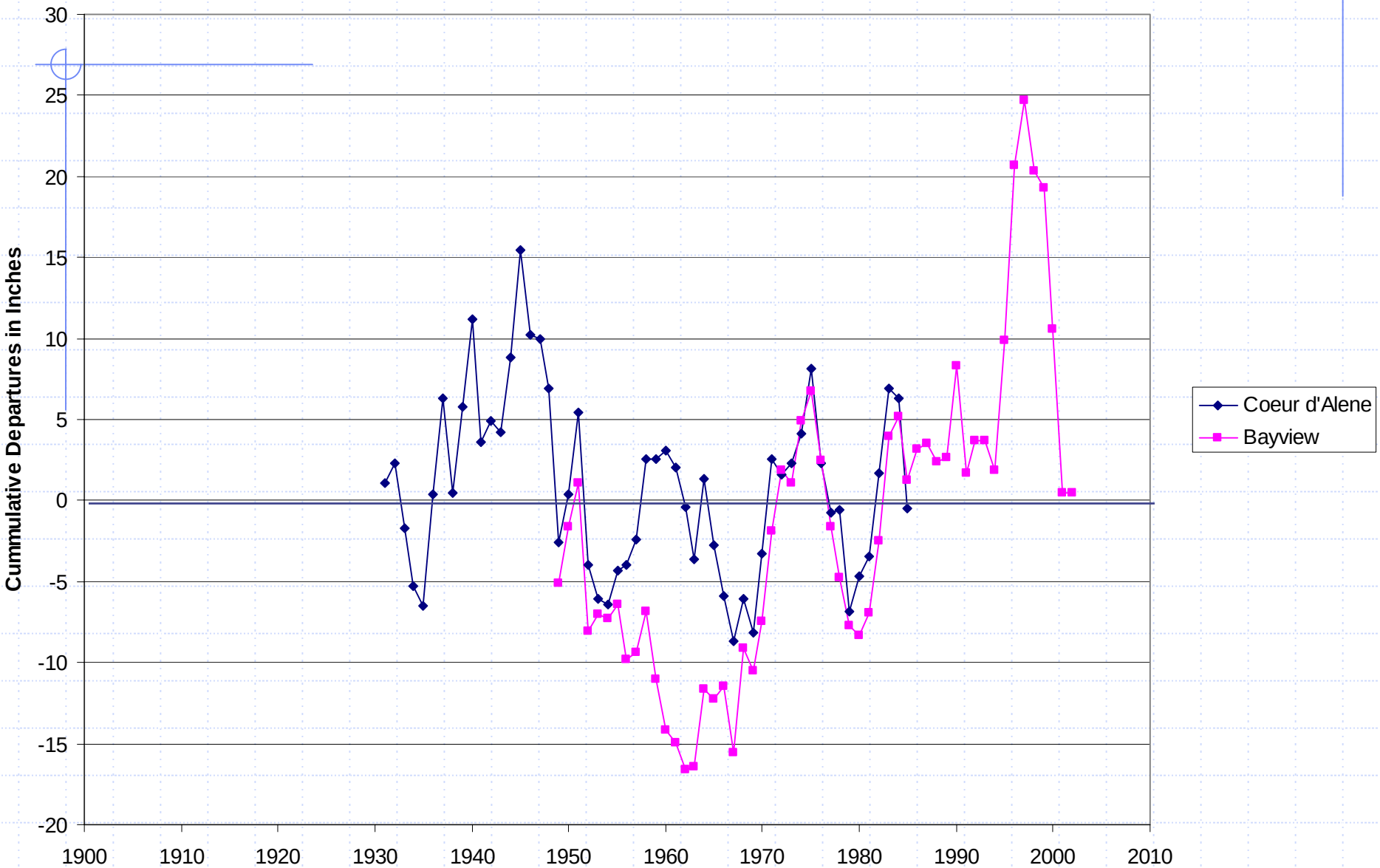


Variations in annual precipitation provide a measure of recharge both on the aquifer and from the tributary watersheds.

Annual Precipitation at Coeur d'Alene and Bayview, Idaho

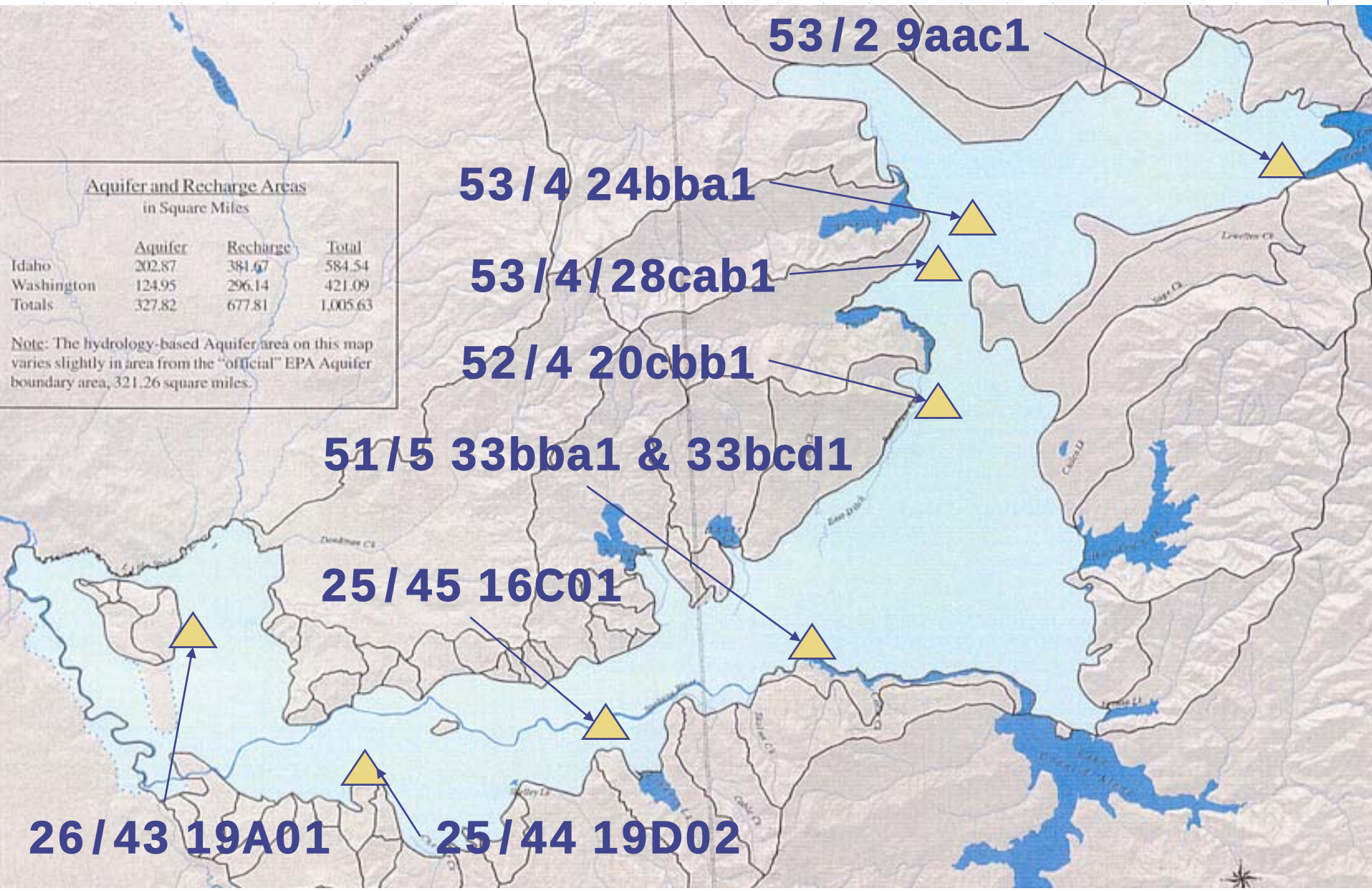


Cummulative Departures From Annual Precipitation at Coeur d'Alene and Bayview, Idaho

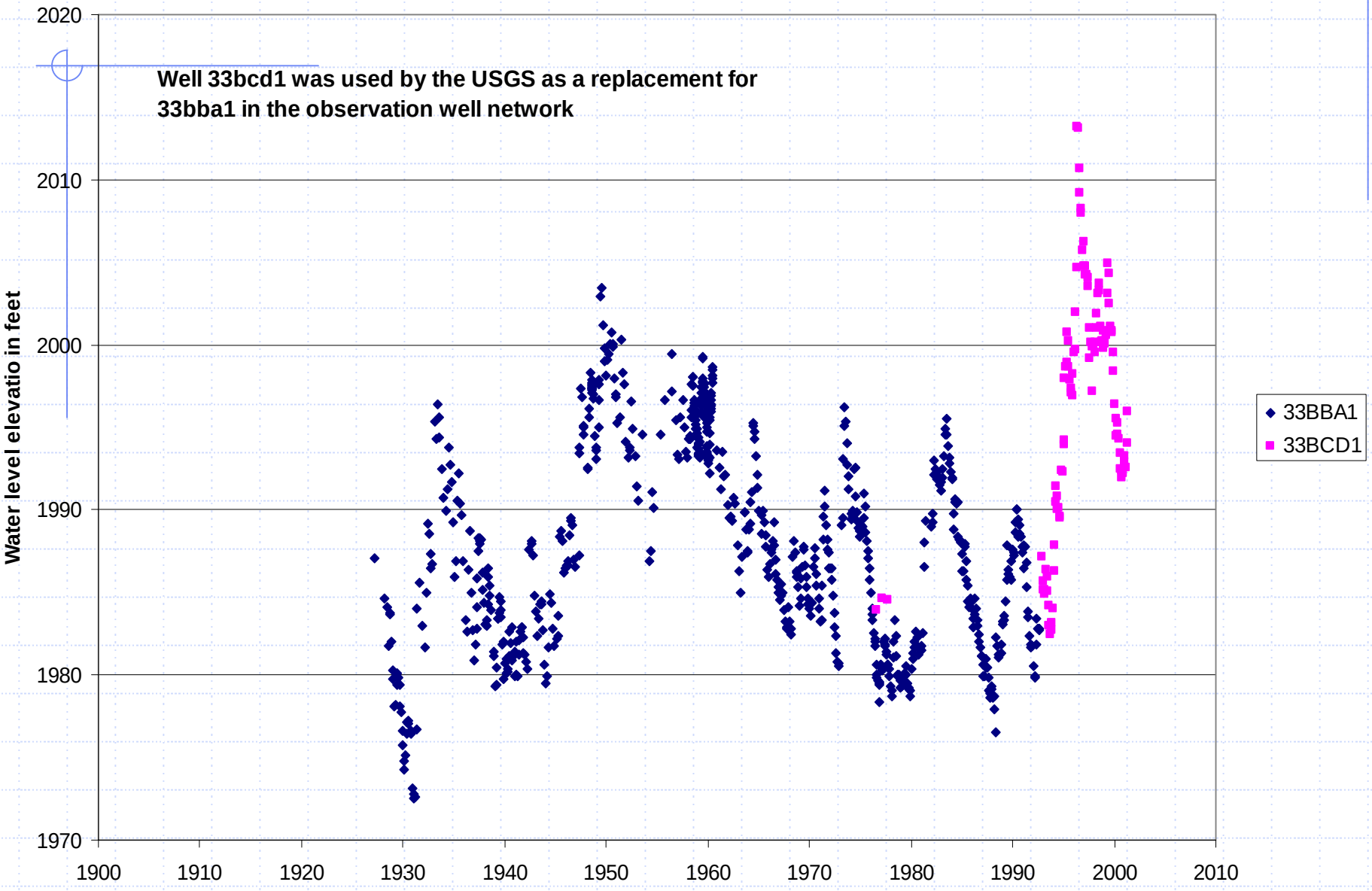


Ground Water Levels Provide a Measure of Recharge and Pumping Impacts

Observation Wells With Long-Term Water Level Records



Water level elevations for wells 51N 5W 33bba1 and 33bcd1 located near Post Falls, Idaho



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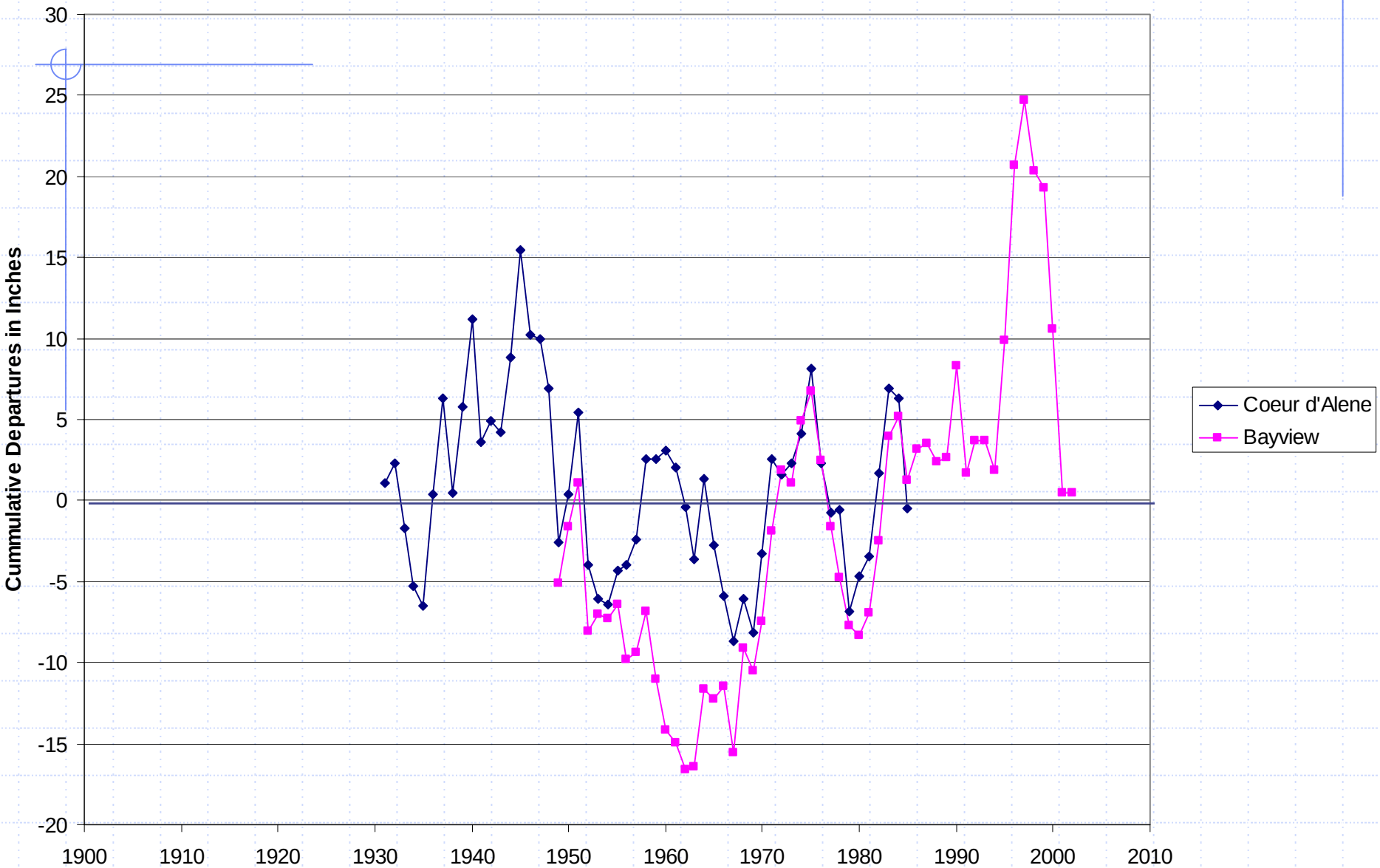
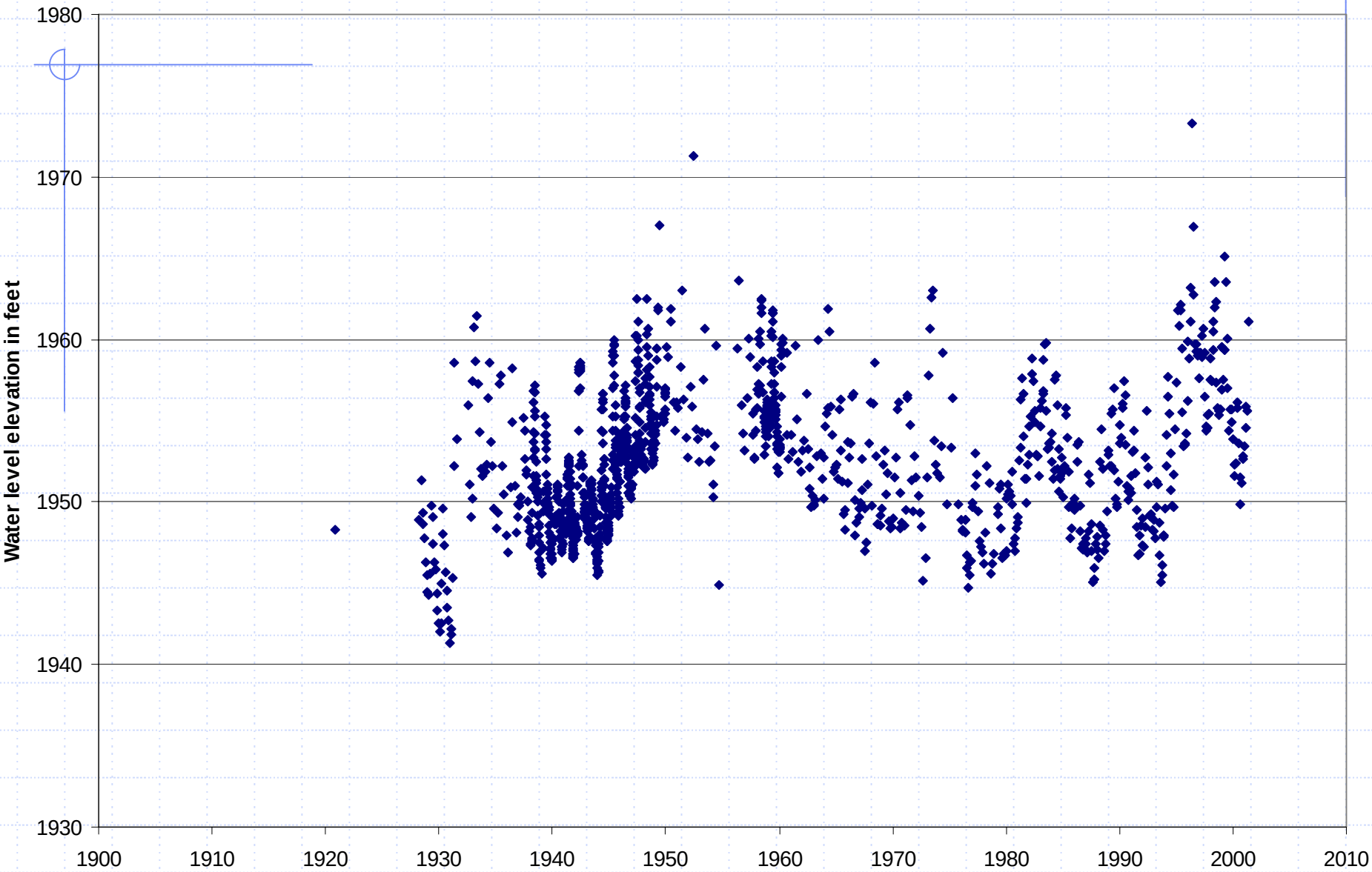


Waterl level elevation for well 25N 45E 16C01 located near Liberty Lake, Washington



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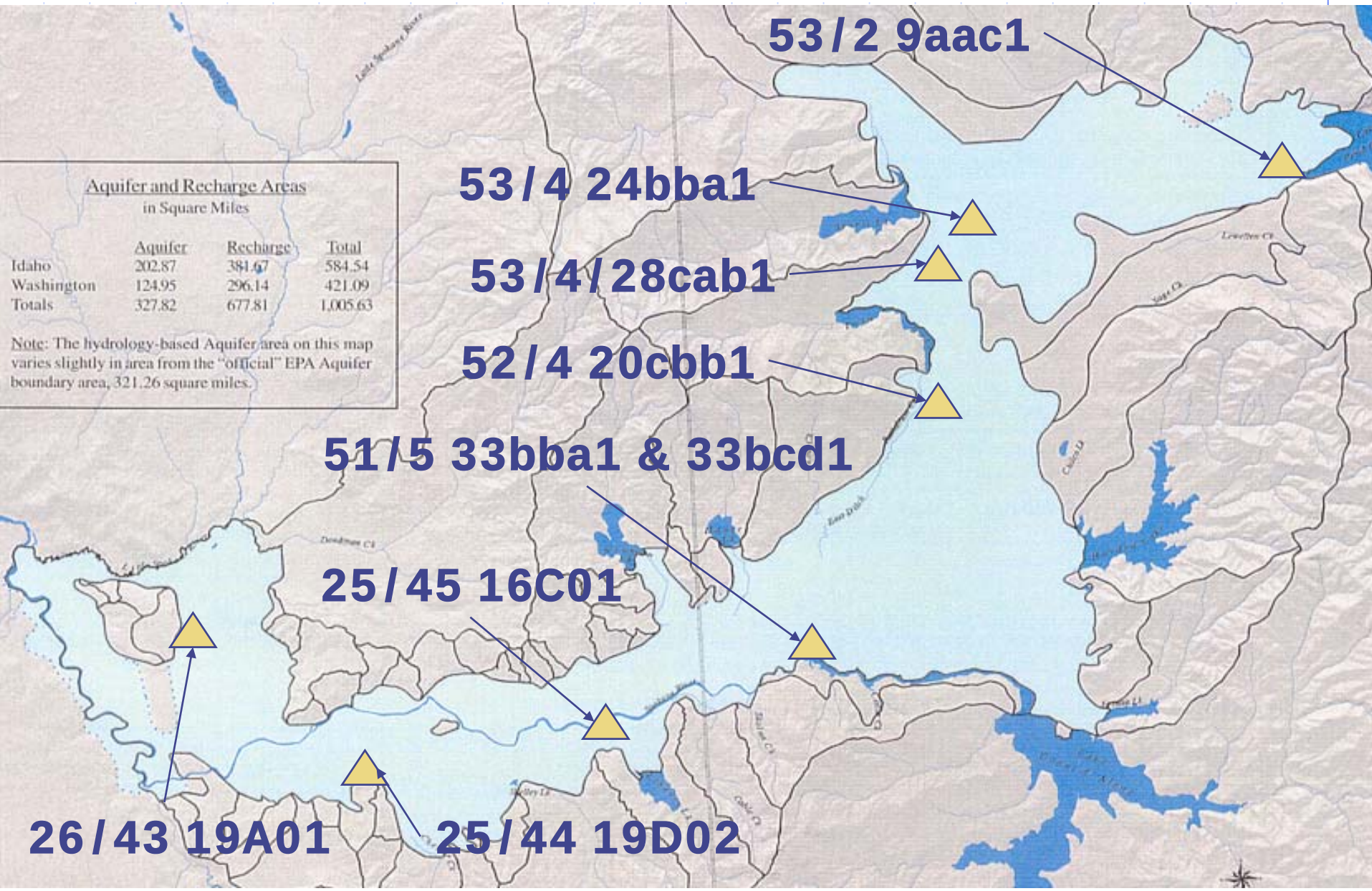
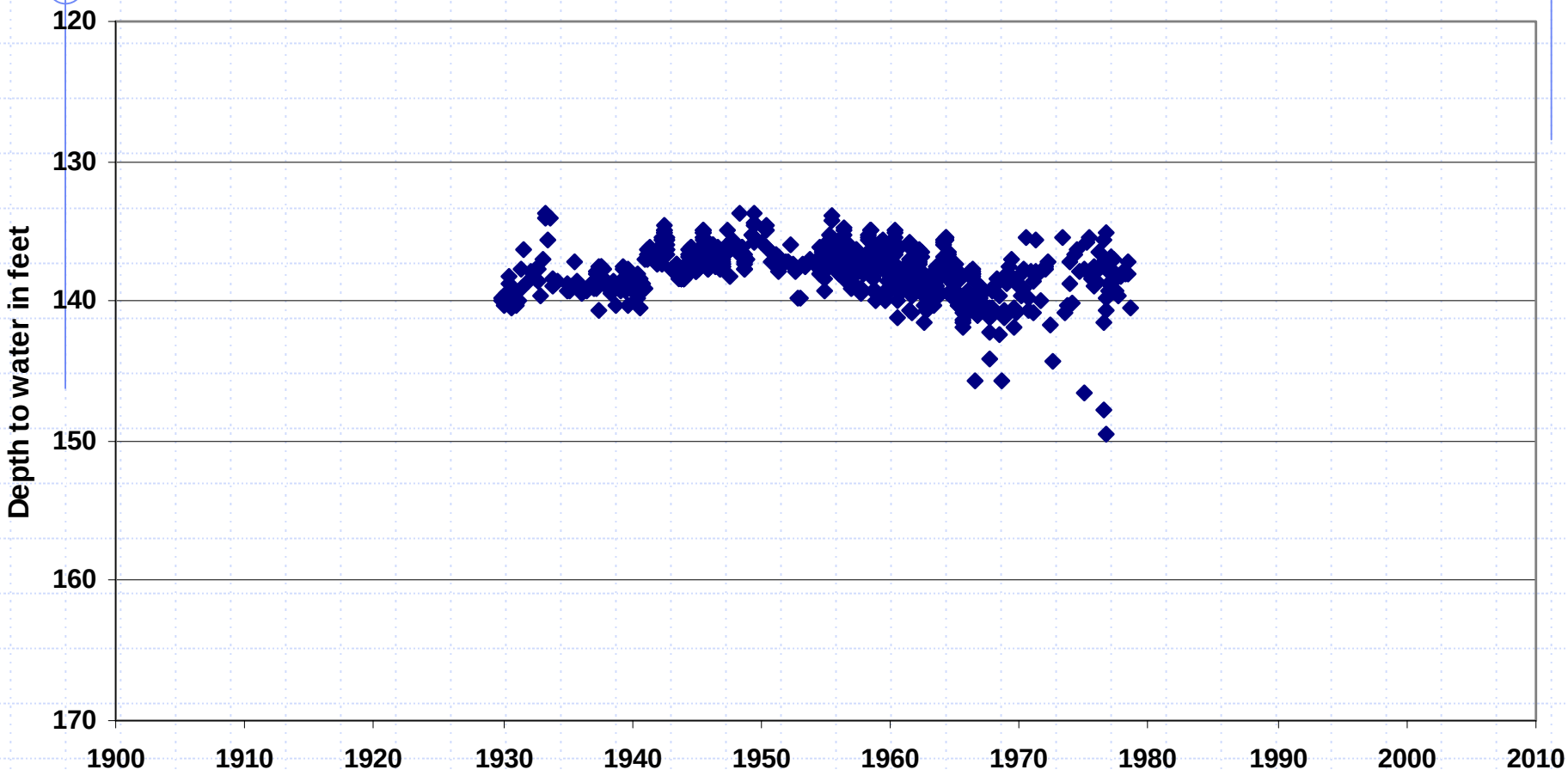
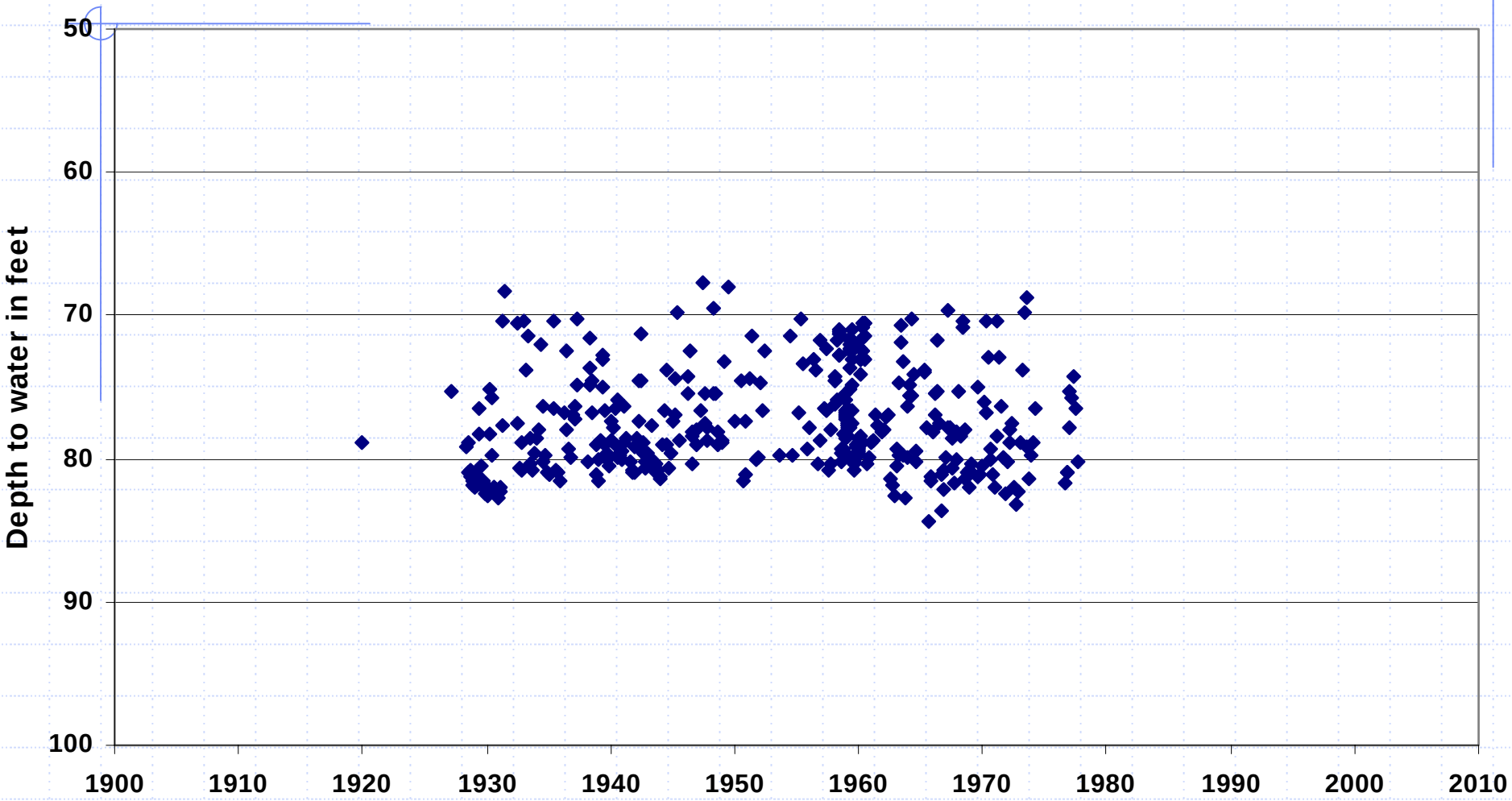


Hydrograph for Well 26N 43E 19A01



Hydrograph for Well 25N 44E 19D02



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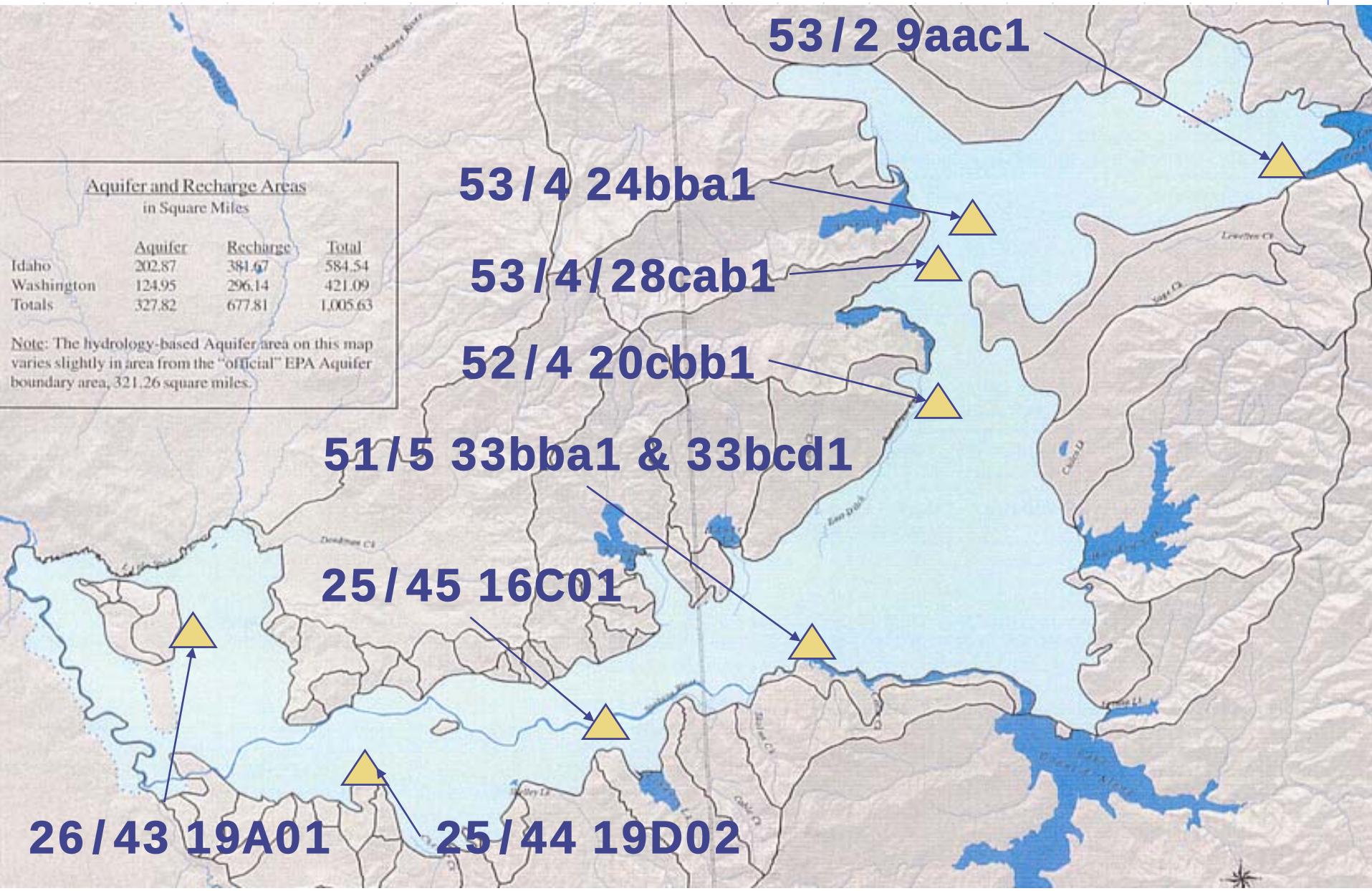
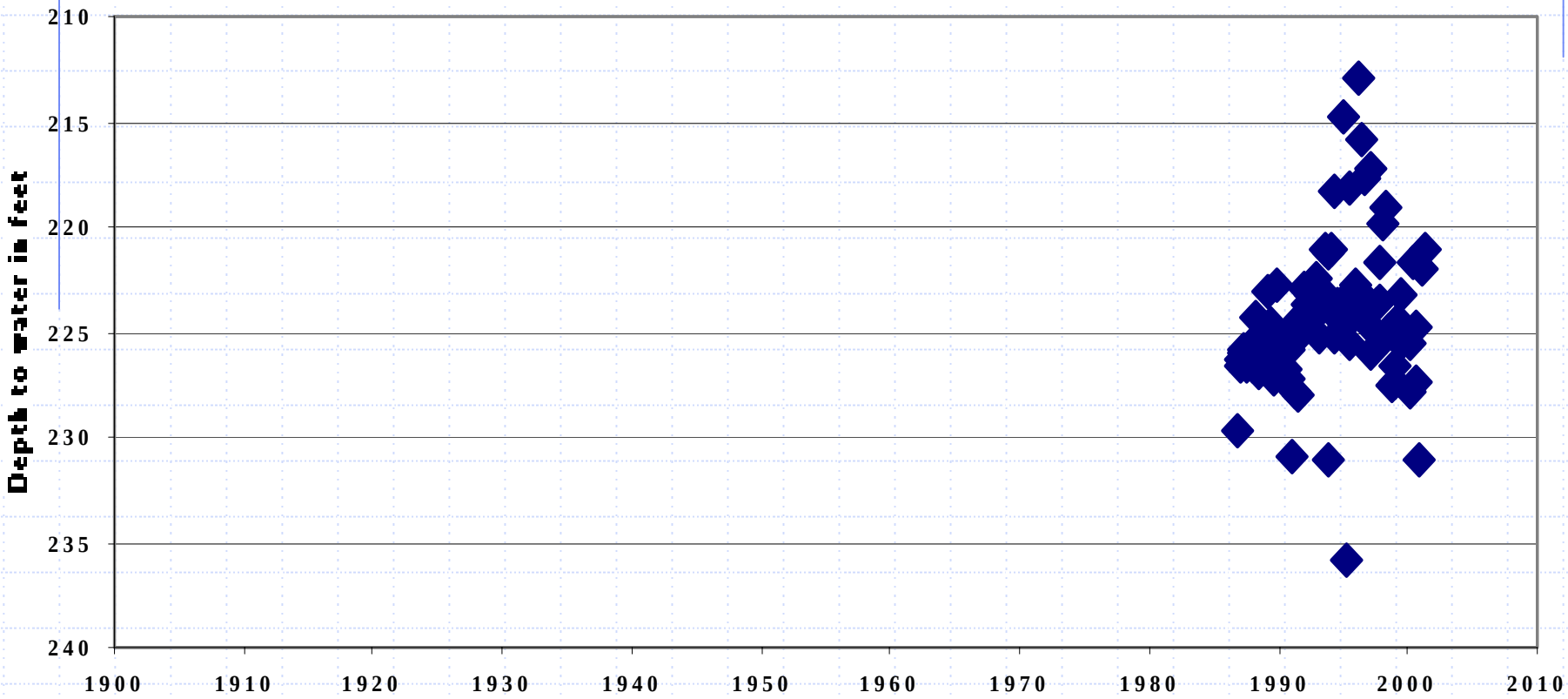


Hydrograph for Well 52N 4W 20ccb1



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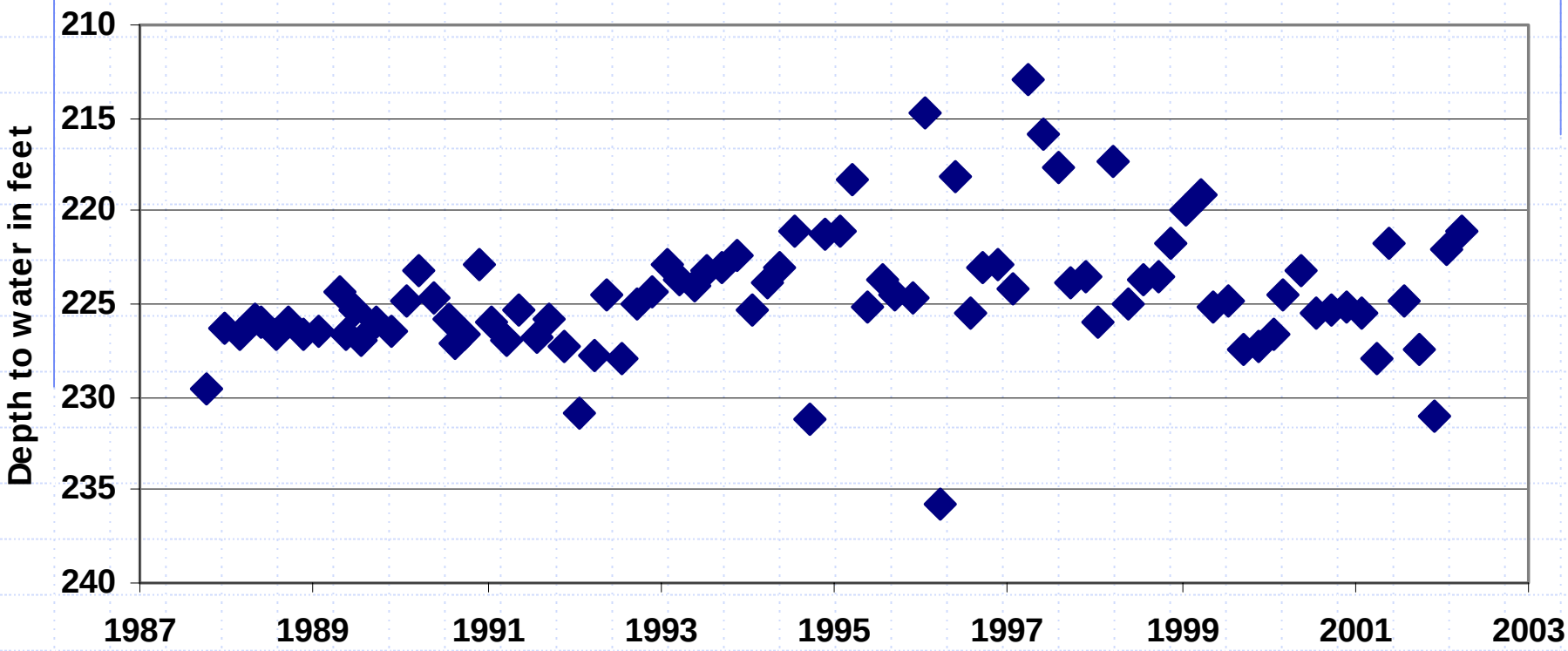
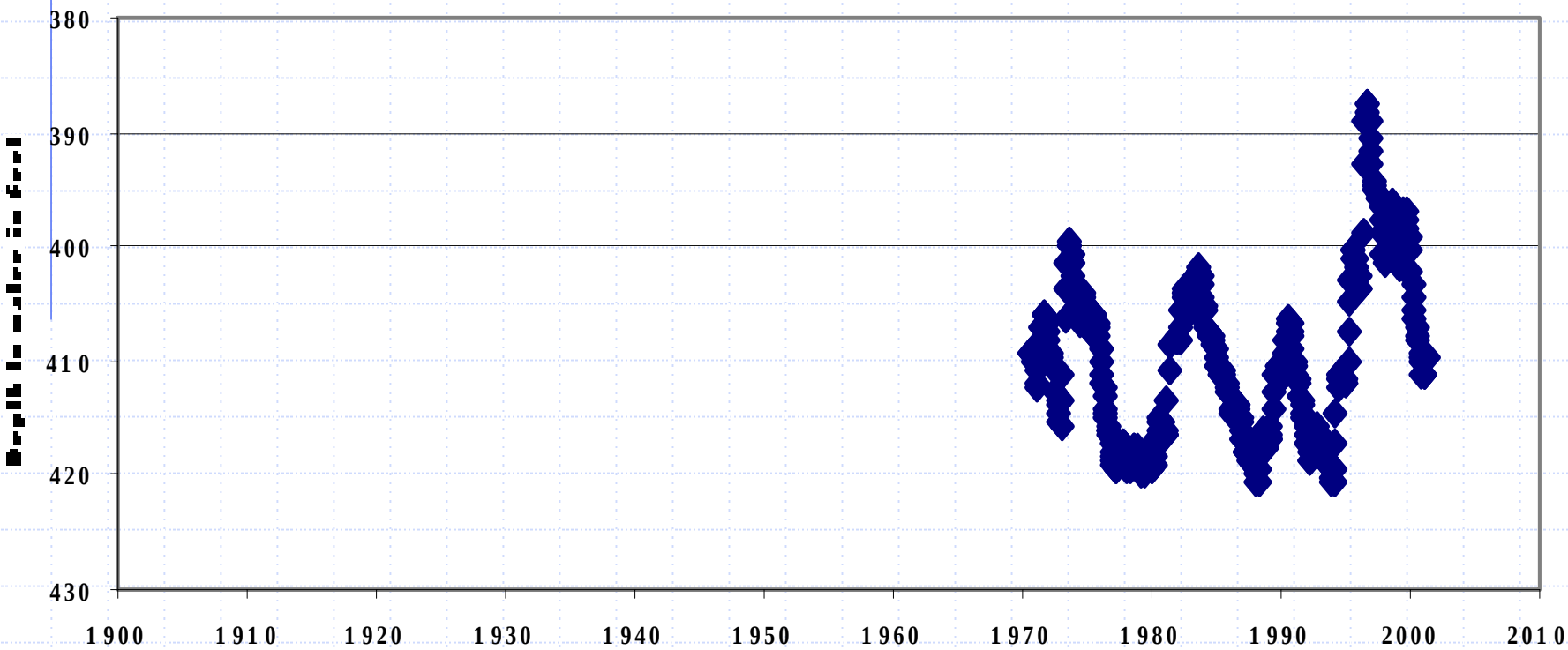
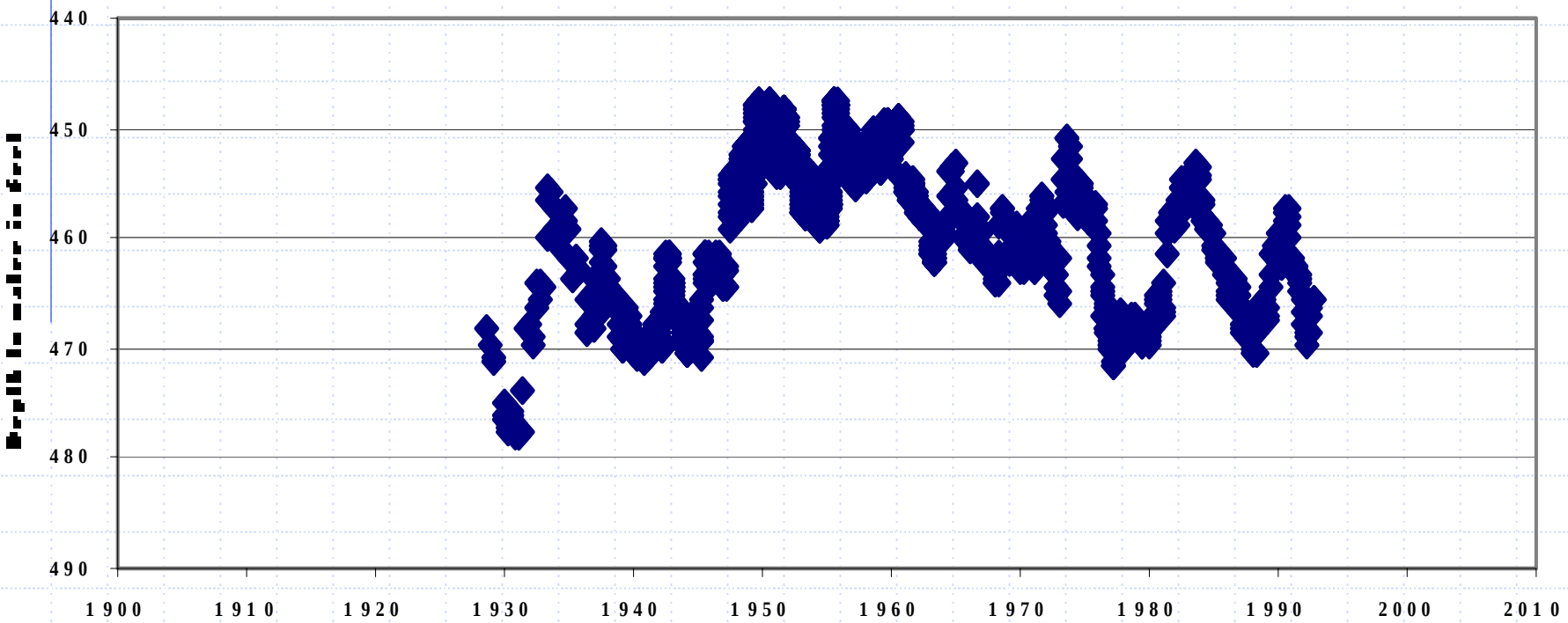


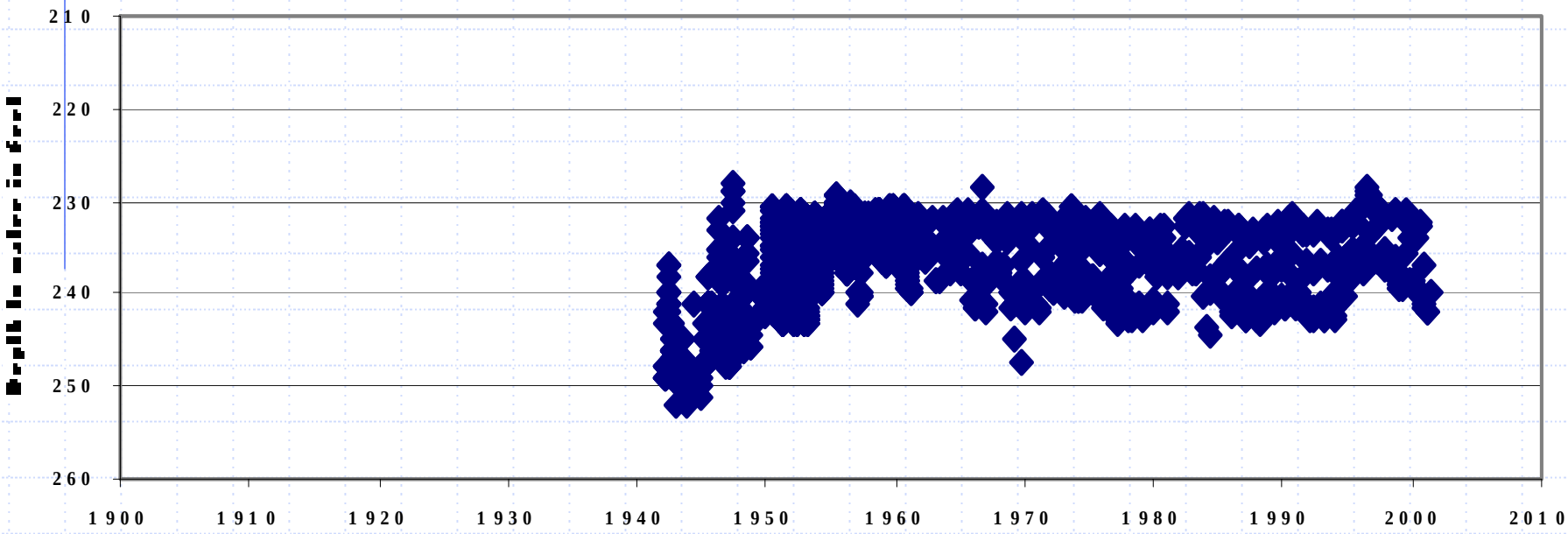
Hydrograph for Well 53N 4W 28cab1



Hydrograph for Well 53N 4W 24bba1



Hydrograph for Well 53N 2W 9aac1



Conclusions From Well Hydrographs

- Ground water levels in 2003 are about the same as a number of times in the past (1934, 1948, 1954, 1975, 1985)
- Dominant control on ground water levels is variation in annual precipitation
- Well development has impacted ground water levels but no long-term water level decline is evident

We have looked at recharge and historic ground water levels. We now need to examine ground water discharge characteristics.

Ground Water Discharge in Idaho

- Consumptive pumpage from wells -- poorly documented
- Ground water flow across state line – estimated
- Ground water does not discharge to any surface water system in Idaho

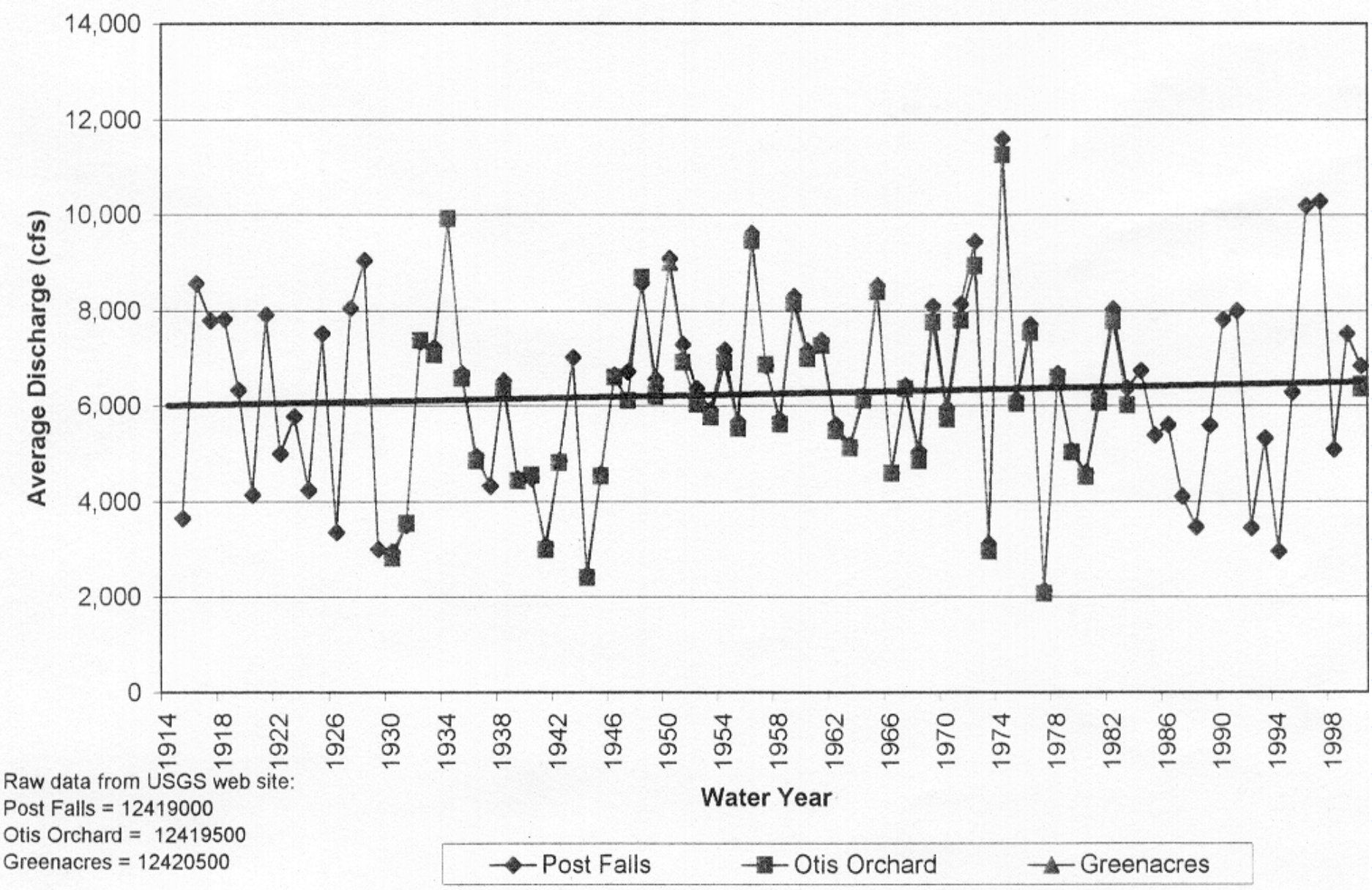
Ground Water Discharge in Washington

- Consumptive pumpage from wells--better documented
- Ground water discharges to the Spokane and Little Spokane Rivers – USGS streamflow stations are in place
- Essentially no ground water exits the basin west of Spokane

Ground Water – Surface Water Interconnection

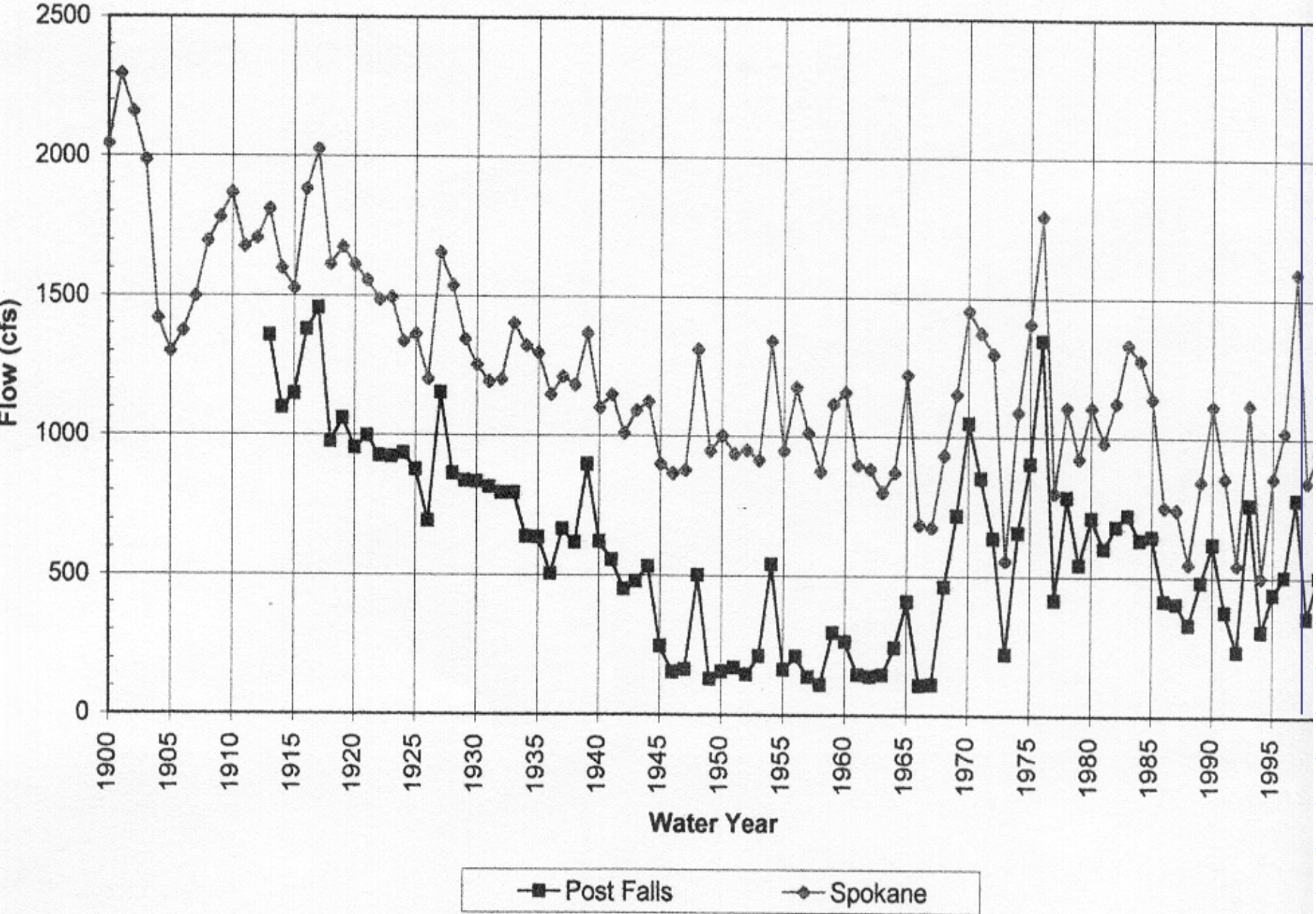
- Ground water withdrawal in Idaho cannot impact surface water in Idaho because the Spokane River and all of the lakes are perched
- Ground water withdrawal in both Idaho and Washington can impact the flow of the Spokane and Little Spokane Rivers in Washington

Average Annual Flow of the Spokane River



Raw data from USGS web site:
Post Falls = 12419000
Otis Orchard = 12419500
Greenacres = 12420500

Minimum 7-day Flow of the Spokane River



Controls for low flow in the Spokane River at Spokane

- Discharge from the Post Falls Dam
- Discharge from the aquifer into the river which is controlled by aquifer water level
  - Dependent on variations in recharge
  - Dependent on consumptive pumping from the aquifer in Washington and Idaho with the greatest impacts from wells close to the gaining reaches of the river

River Flow Problems in Washington

- Low summer flows do not meet target levels set by the fish and game agency
- Problems with recreation on the river
- Problems with water temperature and quality

Water Quality Considerations in the Aquifer

- Aquifer is vulnerable to contamination from surface sources because of the lack of any significant fine-grained layers in the subsurface
- Long-term efforts led by the Panhandle Health Department and IDEQ have been successful in protecting ground water quality in Idaho
- Natural constituents such as arsenic are a problem in some areas

Ground Water Management: Summary -1

- The aquifer within Idaho has not been significantly impacted by development
  - Water quality is excellent in most locations although there are local contaminate areas – continued protection is needed
  - Ground water levels are approximately the same as in previous decades

Ground Water Management Summary - 2

- There are no surface water – ground water issues within Idaho
- The demand for water from the aquifer in Idaho is growing as well as the potential for water quality degradation

Ground Water Management Summary - 3

- Aquifer management is an interstate issue
  - Consumptive ground water use in both states can impact flow in the Spokane and Little Spokane Rivers in Washington
  - Meeting target minimum streamflow levels in both rivers within Washington is the primary water management major issue

Ground Water Management Study Needs - 1

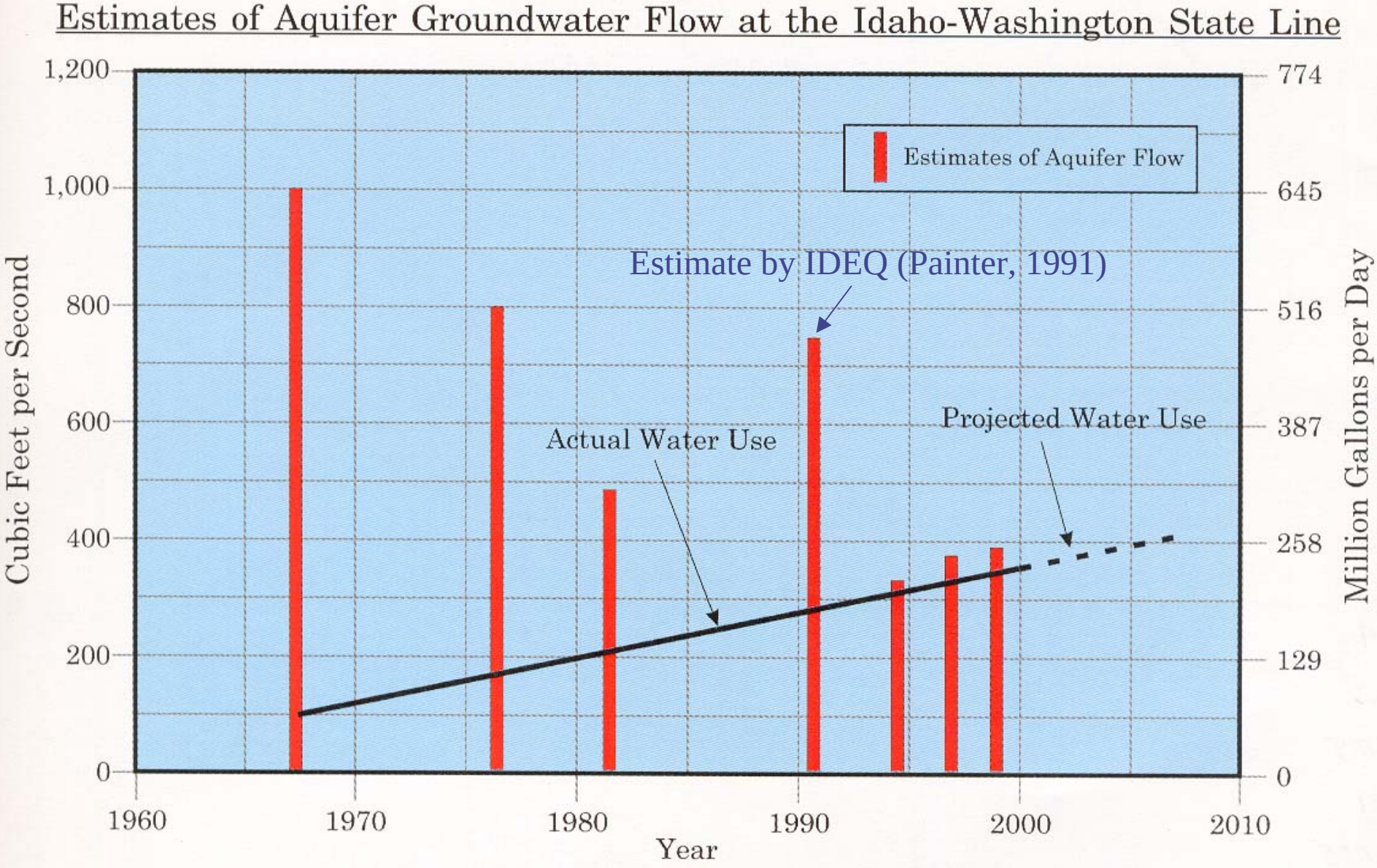
- Aquifer study priorities within Idaho
  - Hydraulic characteristics of the aquifer
  - Recharge amounts and controls
  - Consumptive ground water use

Ground Water Management Study Needs - 2

- Our knowledge of the hydraulic characteristics of the aquifer needs to be expanded
  - Hydraulic conductivity of aquifer
  - Depth of aquifer
  - Hydraulic conductivity of “seal” along the bottom of the Spokane River and the lakes surrounding the aquifer

Ground Water Management Study Needs - 3

- An updated study of recharge to the aquifer in Idaho is needed.
  - Refine estimates of recharge from precipitation, the tributary basins and the Spokane River
  - Analysis of water levels can serve as an independent check on recharge estimates



This graph illustrates the need to obtain better data on both aquifer recharge and water use.

Ground Water Management Study Needs - 4

- Ongoing studies within Washington provide the basis for an improved estimate of consumptive use of ground water
- A companion study within Idaho is needed; our present knowledge of consumptive use of ground water is very limited

Ground Water Management Study Needs - 5

- A series of steady state and transient ground water models of the entire aquifer are needed
  - Develop a data base so that models can be constructed to accurately represent the aquifer, ground water flow and the linkage to surface water systems
  - The “response function” approach used in the Snake Plain aquifer may be useful for analysis of management alternatives.

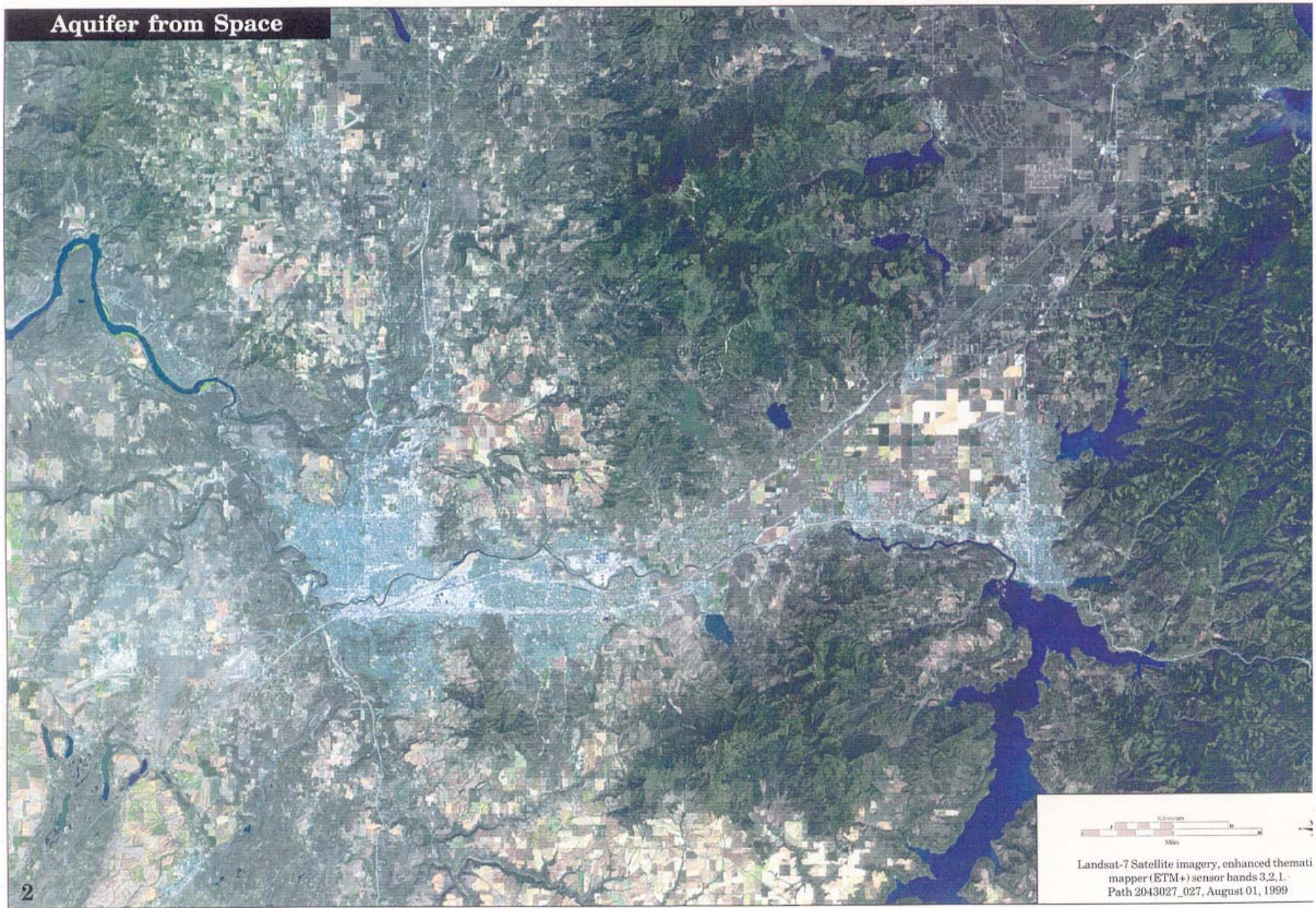
Ground Water Management Study Needs - 6

- Evaluate alternative ways to meet target minimum streamflow levels in the Spokane River
  - Change operation of the Post Falls Dam
  - Curtail operation of wells near gaining reaches of the river during critical periods
  - Explore recharge enhancement alternatives from Spokane River

Ground Water Management Study Needs - 7

- Alternative interstate management approaches should be evaluated
  - Historical interstate approaches range from adjudication, compacts, congressional apportionment and informal basin management groups
  - Both states follow the Appropriation Doctrine but there are significant differences

The state line cannot be seen but it is the dominant issue in effective ground water management



Thank You!!